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REPORT

ON THE

IMPERIAL MYCOLOGICAL CONFERENCE,

1924.

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Letter from the Right Honourable Earl Buxton, Chairman of the Mycological Conference, to the Secretary of State for the Colonies.

DALNESS, TAYNUILT, ARGYLE.

SIR, *9th August*, 1924.

I have the honour to transmit to you the enclosed report on the first Imperial Mycological Conference which was held in London from the 2nd to the 5th of July.

2. I deeply regret that neither the Dominion of Canada, nor the Commonwealth of Australia were able to send delegates to the Conference, but with these notable exceptions, the Conference was widely representative, and it is a matter for congratulation that so many distinguished visitors from the scientific institutions of this country were able to participate in the discussions of the Conference.

3. Modern opinion has been compelled to recognise that the successful combating of crop diseases is scarcely less vital to the prosperity of a country than the prevention and cure of human ailments. My association with the Dominions, where the importance of these problems is perhaps more widely recognised than in this country, has led me strongly to endorse this view, and I am therefore most happy to be able to inform you that the Conference was in every way a success. The discussions both on questions of general interest and on particular scientific problems reached a very high standard and were conducted in an admirable and helpful spirit. Apart from the valuable and far reaching results which may be expected to follow from these discussions, the advantage of establishing personal contact between all those who are interested in the various branches of plant pathology has been so great as amply to justify the convention of the Conference, and that this opinion is shared by all those who attended it is sufficiently shown by the resolution, which was passed unanimously, that similar conferences should in future be held once in five years.

4. The report of the Conference will be brought to the notice of the Managing Committee of the Bureau at an early date, and I will refrain from addressing you with regard to the various resolutions of the Conference until they have been considered by the Committee. I would, however, avail myself of this opportunity of inviting your attention to the gratifying tributes paid on all sides to the work of the Bureau and to the valuable assistance afforded by it to overseas mycologists. You will, I am sure, share the view that no effort should be spared to establish the Bureau on a secure and permanent basis and thus to place it in the front rank of the scientific institutions of the Empire.

5. In conclusion I would express appreciation of the kindness of the Authorities of the Imperial College of Science and Technology, who gave us the use of their rooms in South Kensington for the meetings of the Conference. I wish also to express my thanks to the Managing Committee and to the Director of the Bureau for the admirable arrangements made for the Conference, and to the British Mycological Society for their hospitable entertainment of the delegates.

I have, etc.,

BUXTON,

Chairman of the Imperial Mycological Conference.

THE RT. HON. J. H. THOMAS, M.P.,

Secretary of State for the Colonies.

REPORT ON THE IMPERIAL MYCOLOGICAL CONFERENCE, 1924.

ORIGIN.

At the 8th General Meeting of the Honorary Committee of Management of the Imperial Bureau of Mycology, held in the Colonial Office on 30th May, 1923, a resolution was passed recommending that an Imperial Mycological Conference should be held in 1924 at approximately the same time as the Imperial Botanical Conference.

DELEGATES.

The following delegates were selected by their respective Governments to attend the Conference :—

Self-governing Dominions.

Commonwealth of Australia—Dr. E. J. Butler, C.I.E.
Dominion of New Zealand—Mr. G. H. Cunningham.
Union of South Africa—Dr. Ethel Doidge.
Irish Free State—Dr. P. A. Murphy.

India.

Dr. E. J. Butler, C.I.E., and Dr. F. J. F. Shaw.

Australian States.

New South Wales—Sir Timothy A. Coghlan, K.C.M.G., I.S.O (Agent-General).
Victoria—Mr. H. G. W. Neale (Acting Agent-General).
Queensland—Mr. Patrick J. Dillon (Acting Agent-General).
South Australia—The Hon. Sir Edward Lucas (Agent-General).
Western Australia—The Hon. H. P. Colebatch, C.M.G. (Agent-General).

Colonies not possessing responsible governments, Protectorates, &c.

Ceylon—Mr. C. H. Gadd.
Cyprus—Mr. W. Bevan.
Gold Coast—Mr. R. H. Bunting.
Jamaica—Mr. C. G. Hansford.
Imperial College of Tropical Agriculture, Trinidad—Professor S. F. Ashby.
Mauritius—Mr. C. H. Gadd.
Nigeria—Mr. T. Laycock.
Nyasaland—Captain C. Smee.
Sierra Leone—Mr. M. T. Dawe.
Sudan—Mr. R. E. Massey.
Trinidad—Mr. W. Nowell.
Uganda—Mr. T. D. Maitland.
Zanzibar—Miss E. J. Welsford.

VISITORS.

Invitations were issued to some forty mycologists in Great Britain, including those attached to the Ministry of Agriculture and other Government Departments; to the Universities and teaching institutes; to the Royal Botanic Gardens, Kew, the British Museum (Natural History), and various research stations such as the Rothamsted Experimental Station; and to other agricultural and horticultural institutions. Several overseas mycologists present in England on leave or otherwise also were invited to attend the meetings.

ARRANGEMENTS FOR THE CONFERENCE.

These were entrusted to a sub-committee of the Managing Committee consisting of Sir David Prain, Professor Farmer, Professor Blackman, Dr. Pethybridge, with Dr. Butler, Director of the Bureau, and Mr. Clutterbuck, Secretary to the Managing Committee.

The list of agenda was drawn up by this sub-committee after communicating with the overseas governments concerned, and accommodation for the meetings was arranged at the Imperial College of Science and Technology, the College Authorities very kindly placing suitable rooms at the disposal of the Conference. The sub-committee also considered the financial requirements and work of the Bureau for the next few years, and prepared a memorandum which was approved, together with the other arrangements, at the 10th General Meeting of the Honorary Committee of Management.

PROGRAMME.

The following programme was arranged for the Conference :—

Wednesday, 2nd July.

Morning.—Opening of Conference by Earl Buxton.
Activities and organisation of the Bureau (continued on July 5th).

Afternoon.—Publications of the Bureau.
Visit to the Bureau at Kew.

Thursday, 3rd July.

Morning.—Co-ordination of investigations of fungicides.
Plant disease surveys in the British Empire.

Afternoon.—Standardisation of popular and scientific nomenclature in plant pathology.
Encouragement of industrial enterprise in the investigation of plant diseases.

Evening.—Visit to the plant disease exhibit in the Tropical Health Section, British Empire Exhibition, Wembley.

FRIDAY, 4TH JULY.

Morning.—Discussion of diseases of tropical plantation crops (citrus, cotton, banana).

Afternoon.—Discussion of diseases of tropical plantation crops (cocoa).

Influence of soil conditions on plant disease.

Evening.—Dinner to the overseas mycologists by the British Mycological Society.

SATURDAY, 5TH JULY.

Morning.—The application of the results of mycological investigation.

Activities and organisation of the Bureau (continued from July 2nd).

Closing of the Conference.

INVITATIONS TO OTHER CONFERENCES.

The members of the Conference with few exceptions attended the Imperial Botanical Conference from 7th to 16th July, considerable attention being given to economic mycology at this Conference. The Ministry of Agriculture and Fisheries also issued invitations to all members of the Mycological Conference to attend a conference on 17th July to discuss the important question of legislation regulating the import of plants and plant products with a view to preventing the introduction of plant diseases. The discussions and excursions at these conferences covered a very wide field and materially assisted in making this first meeting of Empire mycologists a success.

OPENING OF CONFERENCE.

The Conference was opened by Earl Buxton on 2nd July. After welcoming the delegates and visitors he gave a brief account of the foundation of the Bureau and of its organisation, control, and the objects of its work. He drew attention to the fact that for the progress of the tropical Colonies the fight against diseases of plants is scarcely less important than that against human diseases, while in the Dominions there was abundant evidence that the importance of this subject was more vividly realized than at home, owing to the magnitude of their agricultural interests and the greater severity of the diseases of their crops.

DISCUSSIONS.

A summary of the discussions at the Conference is given in Appendix I to this Report.

ORGANISATION AND ACTIVITIES OF THE BUREAU.

This subject was considered at the first meeting of the Conference, at which Dr. Butler (Director) gave a detailed account of the working

of the Bureau, and referred to a Committee which reported at the closing meeting. This Committee was composed as follows :—

Dr. Rendle, Dr. Pethybridge (representing the Managing Committee) ; Mr. Nowell, Mr. Bunting, Dr. Doidge, Mr. Cunningham, Dr. Shaw, Professor Ashby (representing the delegates) ; Dr. Butler (representing the Bureau), with Mr. Clutterbuck as Secretary.

The Report of the Committee is given in Appendix IIA to this Report. After examining the financial position of the Bureau and its requirements in the immediate future, the Committee recommended that an annual income of £6,500 should be guaranteed for the next five years. Details of the staff required and the average annual expenditure at present and under the new proposals are given in Appendix IIc. The Report of the Committee was unanimously accepted by the Conference.

THE INTERCHANGE OF SCIENTIFIC STAFFS.

The Government of the Commonwealth of Australia suggested as a subject for consideration by the Mycological Conference the interchange of investigators at certain centres throughout the Empire for periods such as six or twelve months. As, however, the Imperial Botanical Conference had arranged for a discussion of the same subject in regard to botanical science as a whole, it was felt that a better opportunity of considering the proposal would be offered at the latter Conference, the more so as practically all the mycological delegates would be present. Opinion at the Botanical Conference was generally favourable to the proposal.

RESOLUTIONS.

The following resolutions were unanimously adopted by the Conference :—

1. That specimens of the diseases of plants in the different parts of the Empire be sent to the Bureau in sufficient quantity to enable sets of typical specimens to be prepared for distribution to institutions or individuals interested in the study of plant diseases throughout the Empire.
2. That lists of determinations of fungi sent in for naming should be published in leaflet form and distributed from time to time with the *Review*, the name of the sender and locality being indicated in each case.
3. That the Bureau should undertake at an early date the publication of a pamphlet containing the names and addresses of mycologists and plant pathologists in the British Empire, together with an indication of their special interests. This pamphlet should be brought up to date, say, every two years.
4. That copies of index cards dealing with the diseases of such crops as are indexed at the Bureau should be prepared on request and sold to the Government mycologists of contributing Dominions and Colonies at cost price.

5. That, in view of the benefits derived from an exchange of views between overseas mycologists, conferences similar to the present one should be held every five years.
6. That the proposal that the Conference should consider the question of the interchange of investigators at certain centres throughout the Empire for periods such as six or twelve months be referred to the Imperial Botanical Conference.
7. That an annual report showing the contributions for the upkeep of the Bureau made by each contributing Government be circulated to the latter.
8. That the question of the formation of a body or sub-committee for the co-ordination of investigations of fungicides be brought before the Managing Committee of the Imperial Bureau of Mycology with the request that they take such steps as they deem fit.
9. That, while the training of mycologists should include a thorough grounding in the requisite sciences, mycologists should not be required to undertake the duties of entomologists in Government Departments of Agriculture.
10. That the proposals contained in the Report (Appendix II to this Report) of the Committee appointed by the Conference to consider proposals for the future work of the Bureau and their cost be accepted as representing the requirements for the efficient carrying on of the work of the Bureau for the next five years, and that steps be taken to secure the annual income of £6,500 necessary to give effect to them.
11. That this Conference is of the opinion that the financial portions of the Report of the above Committee be especially commended for the favourable consideration of the Managing Committee of the Bureau.
12. That this Conference is of opinion that an urgent need exists for the provision of more adequate accommodation for the Bureau.
13. That this Conference expresses its appreciation of the service rendered by the *Review of Applied Mycology* to all workers on the subject, especially those in overseas Dominions and Colonies, and is of the opinion that one of its most useful features is the length of the abstracts and would regret any curtailment in this respect.
14. That this Conference of overseas mycologists desires to place on record its appreciation of the work which has been carried out by the Imperial Bureau of Mycology, and expresses the hope that this work will be extended when funds permit.

VOTE OF THANKS.

A special vote of thanks was passed by the Conference to the Authorities of the Imperial College of Science and Technology for the use of their rooms for the meeting of the Conference.

APPENDIX I.

IMPERIAL MYCOLOGICAL CONFERENCE.
JULY, 1924.

MEETING: THURSDAY, 3RD JULY, 10.30 a.m.

Chair: Mr. W. NOWELL.

Discussion: "Co-ordination of Investigations of Fungicides."

Mr. TATTERSFIELD (Rothamsted), in introducing the subject for discussion, dealt briefly with its historical aspect. Some of the fundamental problems of toxic action will have to be studied on fungi, as these are more frequently available and more convenient to use than insects. The explanations of fungicidal action are quite inadequate. The correlation of chemical constitution with toxicity is difficult, and the speaker suggested that the best method of ascertaining this correlation is to determine the toxic effect of certain compounds and then to see what changes in this toxicity are brought about by the introduction of new groups into the molecule. Toxic substances exist as gases or vapours, liquids, or solids, and each phase presents its own problems. The toxic action of substances on fungi may best be studied in the vapour phase, and the methods employed by Schafer might well be followed in fungicidal work. The liquid phase is complicated by such phenomena as adsorption, wetting, and adhesiveness—a substance may be highly toxic to an insect in the vapour phase and quite innocuous as a liquid. Colloidal substances—often used in liquid sprays—were briefly discussed. Solids present much the same problems as liquid sprays, the speaker pointing out the importance of the size of the particles of insecticides in relation to the openings of the tracheal system of the insects. The methods to be adopted in any investigation should be very carefully scrutinised in view of the variant factors such as temperature, age, acidity, and the like, which may be introduced. Comparison is easier if a 50 per cent. death point is aimed at, a fact which was demonstrated by graphs.

Dr. BRIERLEY (Rothamsted) spoke of the empirical nature of most of the work done on fungicides, and believed that any advance must be based on fundamental investigation. The standardisation of the physical conditions of experimentation was most necessary, and likewise of the organism undergoing experiment as far as this was possible. The problems touched the micro-realms of physics and chemistry. From the facts gained in the minute theoretical investigations carried out in the laboratory, plot experiments should be arranged and these should form the basis of field experiments. Co-ordination of activities was most essential, and the speaker suggested that a small sub-committee be appointed to consider the problems of the investigation of fungicides in order to correlate work on such problems.

Mr. DOWSON (Wisley) mentioned his experiences in East Africa in spraying against coffee leaf disease (*Hemileia vastatrix*). Pickering's lime-water Bordeaux was first used in this connection, but on the supply of lime giving out one of the planters substituted calcium carbide. A fluid containing a black precipitate, which did not settle, was obtained, and this fluid gave a very adhesive spray deposit which acted very efficiently. This was an instance of the empirical way in which fungicides were discovered.

Dr. BUTLER quoted a letter from Captain McDonald (Kenya), which stated that the carbide mixture was still in common use and giving good results.

Dr. WORMALD (East Malling) stressed the injury from Bordeaux mixture and lime-sulphur which is frequently experienced by growers, and held that new and improved fungicides were very urgently required. The wetting, spreading and adhesive properties of a fluid were important. Ammonium polysulphide had been advocated because this substance could be used with soap. A mixture of copper sulphate and soap had been tried and, whilst satisfactory if made up with rain water, formed a sticky precipitate which clogged up the nozzles of the spraying machines if hard water were used, and therefore could not be advised on a commercial scale.

Mr. Briton-Jones (Long Ashton) supported Dr. Brierley's motion in regard to forming a committee, as the problem cannot be dealt with single-handed. He cited instances of the variable and unaccountable action of lime-sulphur sprays—"Keepsake" gooseberries sprayed with lime-sulphur 1 in 60 may show no scorching, although this variety is usually very susceptible, and a similar strength may absolutely fail to control brown rot of plums, which it normally controls satisfactorily.

Mr. Massey (Sudan) mentioned the serious disease of cotton caused by *Bacterium malvacearum*, now raging in the Sudan. The problem of control was one of devising an efficient method of disinfecting the seed, a method being required which would also rid the seed of pink boll worm. Chlorpicrin had been tried, but could not be used practically. The speaker asked for suggestions as to treatment which might be given.

Mr. Nowell (Trinidad) suggested mercuric chloride.

Mr. Massey replied that this substance will not kill the pink boll worm, and that it would be too poisonous for native labour to handle with safety.

Dr. Butler spoke of the difficulty of setting up a committee capable of dealing with the investigation of fungicides, and suggested that the only body which might undertake such work was the Department of Scientific and Industrial Research.

Dr. Brierley had in mind a watching committee rather than one of the kind indicated by Dr. Butler. In the United States officers of the Department of Agriculture were sometimes seconded for special work, and the speaker was rather in favour of the Colonial Office or some other body being approached. No action ought to be taken unless there were distinct prospects of the committee being established.

Dr. Butler said a resolution would probably be regarded merely as a pious wish unless a specific request were made.

Mr. Summers (Shirley Institute), as a member of a committee set up by the Department of Scientific and Industrial Research, strongly supported Dr. Butler's suggestion.

Mr. Nowell spoke of the obvious advantages of such a body as advocated.

Dr. Brierley proposed: "That the question of the formation of a body or sub-committee for the co-ordination of investigations of fungicides be brought before the Governing Body of the Imperial Bureau of Mycology, with the request that they take such steps as they deem fit."

Dr. Paine (Imperial College of Science) seconded the motion, which was carried unanimously.

Meeting: Thursday, 3rd July, 12 noon.

Discussion: "Plant Disease Surveys in the British Empire."

Dr. Butler opened a discussion on "Plant Disease Surveys in the British Empire." He paid a tribute to the work of Mr. Cotton in organizing the Plant Disease Survey of England and Wales. One of the uses of surveys is the value they become to subsequent workers, who otherwise would have no complete record of the diseases of the countries concerned. In new outbreaks of disease it is most important to ascertain whether the parasite is a new introduction or not, as in the latter case the virulence of the epidemic is likely to be due to temporary circumstances and may be expected to pass when conditions become normal. The outbreak of disease caused by *Diplodia corchori* amongst jute in India was cited as a striking case of this kind and reference was also made to the present epidemic of withertip of limes in Dominica. Information on the distribution of diseases can frequently be gathered from the data afforded by disease surveys, for example, maize smut (*Ustilago maydis*) was found to be restricted to the north-west of India, and the two fungi causing wheat bunt were found in the United States to have quite different areas of distribution, *Tilletia tritici* occurring in the western states and *T. levis* in the eastern. Distribution has a practical interest, in that it may indicate where to search for the origin of any new disease which may arise in any particular region, and also may throw light on the potential dangers from such a disease. Plant disease surveys also yield valuable information on the external conditions which induce an attack or which influence the time

when the attack commences—black rust of wheat (*Puccinia graminis*) in the Prairie Provinces of Canada was known to progress from south to north during the summer, and often fails to reach the northern wheat limits in time to cause damage. The bearing of surveys on the question of plant quarantine and control was illustrated by the banana freckle, Panama disease of bananas (*Fusarium cubense*) and *Pythiacystis citrophthora* on citrus. The powers of dissemination of parasites can often be ascertained from surveys, and clues obtained regarding the risks of their introduction into new areas. The introduction of coffee rust (*Hemileia vastatrix*) in Fiji and the distribution of *Fomes lignosus* in India was discussed. The speaker closed by suggesting methods for the carrying out of such surveys—the collecting and identification of material, the keeping of records on the card-index system, and the publication of the records from time to time.

Mr. Cotton (Kew) was of opinion that the initiation and maintenance of a plant disease survey was absolutely essential for the agricultural progress of any country. He described briefly the history of the survey of England and Wales, and emphasized its importance in estimating losses from diseases, in legislation, and in replying to queries from foreign countries which wished to safeguard their crops by plant quarantines. Some difficulty was experienced in keeping alive interest in the survey, but personal contact with correspondents was very helpful in this direction. Surveys often gave important information on the distribution and relative intensity of diseases and on various aspects of their biology.

Dr. Shaw (India) stated that in 1921 a list of all the specimens of fungi in the Pusa Herbarium was published and was available for any mycologist who applied for it. A smut disease of mustard had appeared in India, and it was very useful to them to find that this disease had only previously been recorded from Denmark. Recently the schedule of prohibited plant imports had been revised, particularly in respect of Fiji disease of sugar-cane, and it became of the utmost importance to know accurately the present distribution of this disease.

Miss Wakefield (Kew) paid a tribute to the work of collectors of fungi in the tropical colonies, who sent their material to Kew for working out, particularly to Mr. Maitland (Uganda), who had been instrumental in greatly advancing the knowledge of the fungi of that region. She gave suggestions for collecting, and agreed with Dr. Butler that the identification of a number of similar fungi at the same time economized labour. The *Kew Bulletin* was available for records of fungi.

Dr. Brierley (Rothamsted) said the importance of plant disease surveys was obvious and would yield information on the methods of dispersal of fungi and on meteorological factors in relation to the incidence of disease.

Dr. Doidge (South Africa) briefly described the work being done on the survey of diseases in South Africa.

Mr. Gadd (Ceylon) described the method adopted in Ceylon, where they recorded the fungi parasitic on economic plants and had published a first list.

Dr. Shaw (India) stated that the Pusa lists are compiled from a card index.

Mr. Nowell (Trinidad) spoke regarding the circulation of the results of plant disease surveys. He suggested that a leaflet be published by the Bureau every year giving the diseases occurring in the different countries.

Dr. Butler suggested that new records of fungi should be included in the Annual Reports, and abstracts of these would be published in the *Review of Applied Mycology* and would be noted in the index. He would undertake to get any lists of new records published in one of the current journals.

The meeting then adjourned.

Meeting: Thursday, 3rd July, 2.15 p.m.

Chair: Dr. G. H. Pethybridge.

Discussion: "The Standardisation of Popular and Scientific Nomenclature in Plant Pathology."

Mr. Cunningham (New Zealand) introduced a discussion on "The Standardisation of Popular and Scientific Nomenclature in Plant Pathology." His object in bringing forward this subject was to arrive at some definite conclusion regarding

the usage of popular names. He cited the case of black rot of apples (*Physalospora cydoniae*) which occurs under twelve names, and fireblight (*Bacillus amylovorus*), which is known by nine names. Diseases must have popular names and confusion must result if these are not standardised. Frequent change of scientific names is a fruitful source of trouble. There is considerable divergence of usage in scientific nomenclature also and, until some standard basis for the distinguishing of species from one another is adopted, there are bound to be constant difficulties arising. It is not enough to have "International Rules of Nomenclature;" we must have common ideas as to what we mean by a species. The speaker cited the case of *Puccinia elymi*, which is morphologically identical with *P. triticina* and which has 19 synonyms, based on biological characters. He held the view that species should only be separable on morphological grounds and not on biological ones.

Mr. Cotton (Kew) stated that the Pathological Committee of the British Mycological Society had undertaken the work of standardisation of common names in England and Wales. Work had been delayed somewhat until the publication of the Plant Disease Survey for 1921, but the list of diseases in that publication was now being critically reviewed by the committee and most of the cereal diseases had been dealt with. The principles which the committee had decided to adopt were: (1) that the name in most common use by the farmer should be adopted; (2) that the name adopted should, if possible, describe the disease; (3) that as far as possible the name adopted should conform to that used in foreign countries; (4) that there should be no system of priority and no attempt to apply the international rules of scientific nomenclature in deciding on the name to be selected.

Mr. Briton-Jones (Long Ashton) deprecated attaching much importance to common names; the scientific name was the one that mattered.

Dr. Butler pointed out that people wrote papers using only popular names for diseases, and one of the most troublesome tasks in making such papers available for the benefit of others was the identification of the parasites with which the paper dealt.

Mr. Briton-Jones stated that he ignored any literature in which scientific names did not appear.

Dr. Murphy (Irish Free State) suggested that we should come to some agreement with the Americans as to the popular names adopted as standards.

Mr. Hansford (Jamaica) spoke of his work on *Fusarium*, pointing out the difficulty of identifying species in this genus and the confusion in their nomenclature.

Mr. Cotton (Kew) thought that it was essential to have common names for administrative and practical purposes. It was absolutely impossible to use only scientific names to farmers. He inquired if Mr. Cunningham would regard *Puccinia triticina*, *P. simplex*, and *P. glumarum* as distinct species or as one.

Mr. Cunningham stated that the species quoted were distinct, as they differed morphologically.

Dr. Pethybridge (Ministry of Agriculture) emphasized the importance of well-selected popular names. He thought it probable that, whilst some difficulty may be experienced in inducing the present farmers to adopt standard names, future generations will probably do so, especially if children in rural schools are given some elementary training in regard to plant diseases.

Suggestions as to the form in which the list of standard names should be printed were also given.

Meeting: Thursday, 3rd July, 3 p.m.

Discussion: "The Encouragement of Industrial Enterprise in the Investigation of Plant Diseases."

Mr. Tunstall (Indian Tea Association) opened a discussion on "The Encouragement of Industrial Enterprise in the Investigation of Plant Diseases." He briefly described the history of the development of the scientific department of the Indian Tea Association. The department was started in 1900 largely as a result of the stimulus afforded by the success achieved by Dr. Bamber in Ceylon. It

was supported entirely by the tea industry, except for a Government grant which was now only a very small proportion of the total cost. In 1911 mycological and entomological departments were added, and in 1912 a larger laboratory was built. Corresponding with this scientific development was a remarkable increase in the yield of tea per acre, which amply repaid the cost of the research scheme. The latter amounted to about 8*d*. or 9*d*. per acre. Instances of the usefulness of the mycological department were given. Unorganized cultivation industries, however, are not suitable for undertaking research work; continuity of the work is essential, and the use of highly-paid specialists for short terms has not yielded fruitful results. The speaker referred to the assistance given by the Agricultural Research Institute at Pusa. In the nature of the work it was necessary for the scientific staff to be placed in the centre of the tea-growing districts, which were isolated from scientific centres in India, and the staff had to make frequent visits to such centres as Pusa in order to keep abreast of the progress of science. Without the assistance received from such centres it would have been difficult to carry on the work. The Government of a country could encourage non-official enterprise on the lines of the Tea Association research department by means of grants, and, in return, the Government should have a call on the services of the department in certain cases. For instance, non-members of the Tea Association can only have the services of the Association's officials through the Government and not directly. The Government of the country should, he thought, work in co-operation with these industrial departments, not in rivalry, and should therefore avoid establishing Government stations to do the same work.

Dr. Butler said that on his tour round the world in 1923 he had been much impressed with the excellent work being done by private enterprise. The Hawaiian Sugar Station cost £40,000 a year, but the planters were well satisfied with the results and the control of sugar-cane diseases in Hawaii was scarcely equalled elsewhere, except, perhaps, by the Colonial Sugar Refining Company, which operates in Fiji, New South Wales and Queensland, and has a highly competent scientific staff. In the latter States five major cane diseases occur, but these are all well under control. Mr. North, the very able pathologist of the Company, was formerly prevented from publishing the results of this work, but this prohibition has now been withdrawn. Dr. Butler quoted from a leaflet of the Sugar Refining Company to explain the power and influence such a corporation has over its members, a power which could not possibly be exerted by any Government Department. With regard to the clashing of interests between the private and Governmental institutions, this was quite avoidable, as shown by the cases of Hawaii and India. Some leading entomologists were strongly inclined to the view that the whole work of field control should be taken over by private enterprise and that the Government officers should be kept more as research workers.

Mr. Gadd (Ceylon) described the Ceylon Rubber Research Scheme organized in conjunction with the Rubber Growers' Association. Similar proposals were under consideration with regard to the tea and coconut industries in Ceylon. The speaker agreed that only organized industries could undertake the establishment of scientific departments and was in favour of the actual control work of diseases on estates being carried out by the industries themselves.

Colonel French (Empire Cotton Growing Corporation) stated that the funds of his association were obtained mainly from the spinners in Lancashire. The Corporation is: (1) finding students to go out into the colonies to grow cotton; (2) encouraging training in research by grants to research institutes and schools of agriculture; (3) sending out experts to assist the agricultural departments. The establishment of a central research station for cotton had been suggested, but the conditions under which cotton is grown vary so greatly in the different countries as to make it difficult for a central station to deal with the problems of improving cotton cultivation on a sufficiently comprehensive basis. There was also the suggestion of taking on the research work of the Government Departments, the latter confining themselves to control and propaganda.

Mr. Dowson (Wisley) considered that the best arrangement was for growers to organize themselves into associations which would carry out their own control work.

Dr. Butler asked for expressions of opinion as to the best arrangements for the control of the staff where Government and an industry shared the work.

Dr. Shaw (India) instanced the rubber industry in South India. A Government mycologist was seconded for work under the industry and this was the general method being adopted in South India.

Mr. Tunstall mentioned the new tea department in South India, and its relation to the northern tea department.

Dr. Pethybridge mentioned the scientific staff maintained by certain glasshouse growers in England. He then raised the question of the education of plant pathologists and expressed the view that a sound agricultural or horticultural training is needed before the special mycological training is added.

Dr. Butler, in connection with the subject of mycological training, mentioned that the Government of Zanzibar had suggested for discussion the question whether advisory phytopathological officers should not be trained to deal with both insects and fungi. This suggestion had been received too late to be included in the list of agenda and the subject was a very large one, which could scarcely be adequately discussed in the short time available. On the specific question whether the one officer could be expected to perform the duties of a mycologist and an entomologist, he would, however, welcome an expression of opinion.

After some further discussion a definite opinion was unanimously expressed that such a course was most unadvisable.

Meeting: Friday, 4th July, 10.30 a.m.

Chair: Professor J. B. Farmer.

Discussion: "Diseases of Tropical Plantation Crops."

Dr. Doidge (South Africa) gave an account of the citrus diseases occurring in South Africa. Citrus canker (*Pseudomonas citri*), the most serious disease affecting citrus trees, was probably introduced into South Africa from Japan in a consignment of trees planted out in the Warmbaths Experimental Orchard in 1905. The disease was first noticed in 1908 and, in the wet season of 1908-09, it spread with amazing rapidity. All the nursery stock at the orchard was burnt and the distribution of young trees stopped. A series of dry seasons followed, but in 1916 75 per cent. of the buds failed at Buffelspoort, and in 1917 another outbreak occurred at Wolhuters Kop in the Rustenburg area. The condition of affairs indicated that the only course to pursue to prevent the ruin of the citrus industry was the eradication of all infected trees. The methods of spread of the disease were discussed, especially carriage by flood water which had been observed to be able to occur up to a distance of 8 or 10 miles. Records of the trees sent out from the Warmbaths orchard had been kept and these consignments were followed up. In 1917, a quarantine was established round the Rustenburg area and money was granted by the Government for a total eradication campaign on which 18 or 20 inspectors were employed. Details of the procedure of the campaign were given and the cost to date was stated to be £117,000. While the present position gave grounds for hoping that the disease had been exterminated, it was necessary to wait for a wet season to be quite sure that this is the case. It is now over two years since the last case was seen, but the organism is known to be capable of living for a long time. Other citrus diseases occupying their attention were concentric ring blotch, the etiology of which is obscure, and lemon scab, which is only serious as a nursery trouble. The causal organism of scab has been isolated, its pathogenicity proved, and it has been recently identified by Dr. Butler as a species of *Sporotrichum*. The paper was illustrated by numerous maps and photographs.

Dr. Butler spoke of the eradication campaign against citrus canker in Florida, and stated that it had been less successful than that in South Africa, the last case recorded being about eight months ago. Besides, it was admitted in America that neighbouring States were infected and it was hard to see how total elimination could be hoped for, whereas in South Africa there was no near centre of infection. If the future bore out the present hopes it would, he thought, be the first case of total eradication of a disease of this kind. He also made

some remarks regarding the indentity of the scab fungus and its relationship to certain human parasites of the same genus of fungi.

Mr. Dowson (Wisley) said he had frequently seen concentric ring blotch in East Africa, especially in the dry season.

Mr. Nowell (Trinidad) spoke of the great importance of the general aspect of eradication methods and thought that the present campaign, if successful, would have a considerable reaction throughout the world.

Chair: Mr. F. A. Stockdale.

Mr. Massey (Sudan), in opening a discussion on the diseases of cotton, gave an account of those occurring in the Sudan. The present outbreak of angular leafspot (*Bacterium malvacearum*) was described. The organism was readily isolated and inoculations proved its pathogenicity. It is always accompanied by a yellow coccus which, however, is not pathogenic. The disease appears immediately after germination in the seed-beds and the effect of humidity and temperature on its course was discussed, detailed data being presented to illustrate this effect. With regard to the question of control, it could be definitely said that the disease was carried over on the seed and the problem was one of seed disinfection. Disinfectants gave healthy plants but subsequent infection occurred, contact being sufficient to bring this about. The organism is unable to survive in the soil and is very susceptible to heat and light in the laboratory. Manure has no effect on the disease. Other allied plants in the Sudan did not become infected, though he had recently heard of a case of the sort in America. Several disinfectants have been tried, including uspulun, mercuric chloride, "sporocide," lysol, and Jeyes fluid. There is less fuzz on Egyptian cotton seed than on American and, hence, treatment with concentrated sulphuric acid is unnecessary. Lysol and the cresol disinfectants with resin soap gave more efficient wetting, and in the present year the whole of the seed of the cotton crop is being disinfected with cresol disinfectants. The ideal treatment would deal with the pink boll worm, simultaneously with the angular leafspot organism and the recent work of disinfection of cotton seed by heating to 100° C. *in vacuo* may prove useful. Other diseases of cotton in the Sudan were briefly described, including an obscure disease, which is suspected to be due to *Rhizoctonia*.

Mr. Briton-Jones (Long Ashton, formerly Ministry of Agriculture, Egypt) spoke of the cotton diseases which are found in Egypt. *Bacterium malvacearum* causes a triangular leaf spot, but is not of serious economic importance in the area with which he was familiar. Root rot, caused by a species of *Rhizoctonia* identical with the fungus hitherto known as *Sclerotium bataticola*, occurs with some virulence. Boll rots are due to infection of the wounds caused by the pink boll worm by the saprophytic fungi *Rhizopus nigricans* and *Aspergillus niger*. Sooty mould occurs and, also, the wilt disease caused by *Fusarium vasinfectum*. Sore shin (*Corticium solani*) is prevalent and is closely dependent on soil and temperature conditions at the time of sowing.

Mr. Nowell (Trinidad) described the varying symptoms of attack by *Bacterium malvacearum* in the West Indies, namely, leaf spotting, bacterial boll rot, and black arm. Any of these symptoms may be manifested to the exclusion of the others.

Mr. Massey stated that in the Sudan, the black arm form predominates, but leaf infection of primary leaves is common. The bolls are not affected to the same extent as elsewhere.

Professor Ashby (Imperial College of Tropical Agriculture, Trinidad) spoke of the different degrees of virulence of the cultures used in experiments in Trinidad and of the effect of climatic conditions on the manifestations of the disease.

Dr. Shaw (India) mentioned briefly the researches now being carried out by Mr. Dastur in India, which indicate that wilted plants contain higher proportions of aluminium salts than the controls and point to the toxic effect of aluminium as the primary cause of cotton wilt, fungi being secondary agents.

Mr. Summers (Shirley Institute) brought forward the subject of the mildewing of cotton fabrics, one which he stated was of vital importance to the cotton industry. The fungi causing these troubles seemed to be usually tropical moulds and the importance to cotton growers of growing clean cotton was emphasized,

as in future the cotton spinners would not be inclined to buy cotton which had a reputation of being contaminated. Any fungus which has the power of lowering the P_H value has the power of spotting fabrics, while fungi which raise the P_H do not produce such striking symptoms but have a tendering action. Disinfection with ammonium silicofluoride and steeping with formalin have been tried.

Mr. Stockdale (Ceylon) elicited further details of the treatment of the seed against *Bacterium malvacearum* in the Sudan. The manifestation of one set of symptoms of the disease to the exclusion of the rest was confirmed for Ceylon. Upland cottons from Madras were stated to be susceptible.

Professor Ashby (Trinidad) gave his paper on the "Panama" disease of bananas. The symptoms and general nature of the disease were described in detail. A toxin was probably produced by the fungus (*Fusarium cubense*) which played a large part in causing the characteristic symptoms. The spread of the disease was chiefly brought about by planting infected rhizomes, and by the transference of infected trash. The organism persists in the soil for at least ten years. The measures for the control of the disease in Jamaica were described and these have so far been successful in that the disease has been kept under control. The real solution of the Panama disease problem was the discovery of an immune variety, and the work in progress at the Imperial College of Tropical Agriculture with this end in view consists of: (1) tests of the "Grenada fig," which so far is resistant and may be identical with the robusta variety in Jamaica and another variety in Surinam, and (2) of breeding experiments. Pollen from seed-bearing bananas has been used for crossing Gros Michel, and out of about 20,000 pollinations 180 seeds were obtained, of which 60 germinated, giving 20 plants, of which 12 were still growing. One seedling of Congo X Gros Michel is also being grown.

Mr. Hansford (Jamaica) said he had isolated many strains of *Fusarium*, similar to that which causes Panama disease, from soils and found that *Fusarium cubense* is only present in areas which are bearing or have borne infected plants. With regard to the robusta variety a trial shipment is to be made, probably this year. The climatic factor seems to play a great part in decreasing the virulence of the disease in Jamaica, and the speaker referred to the fact that on irrigated lands no disease occurs. At present 250–300 acres are kept under isolation in Jamaica, probably about 0·5 per cent. of the healthy area. With this was contrasted the state of affairs in British Honduras, where only 8 to 10 bunches per acre could be gathered, in place of 300, on account of the disease.

Mr. Nowell (Trinidad) stated that the disease had been a deterrent to the banana industry in Trinidad, and other places in the West Indies, as well as in Surinam and Central America.

Dr. Butler offered the services of the Bureau in arranging for reports on any trial shipments of immune varieties which might be sent over.

Mr. Nowell said that they might make a trial shipment during the coming months and might then be glad to accept the help offered by the Bureau.

Mr. Hansford cited instances of unreliable reports of the condition of fruit from commercial sources.

Meeting: Friday, 4th July, 2.15 p.m.

Chair: Mr. F. A. Stockdale.

Mr. Bunting (Gold Coast) spoke of the "Diseases of cacao in the Gold Coast." One of the most important of the diseases prevalent in this area is *Trachysphaera fructigena*. The life history and morphology of this new and interesting fungus were described in some detail and the control measures suggested discussed. Another disease which was occupying their attention was "Collar crack," which was due to the fungus *Armillaria mellea* or to a species closely allied to it. The symptoms produced by this disease consist of characteristic vertical cracks in the trunks of the trees, through which mycelium appears which bears the fructifications. The common parasite *Phytophthora faberi* was very prevalent and caused serious losses. Various thread blights occurred, but had not been identified satisfactorily: they were not of great economic importance.

Mr. Gadd (Ceylon) said that *Phytophthora faberi* was the most serious disease of cacao in Ceylon. The question of the identity of the *Phytophthora* on rubber with that on cacao was discussed. The form from rubber infects cacao with difficulty and vice versa. Mixed cultures indicated that there are + and — strains, and that mixed cultures of unlike strains gave oospores.

Mr. Nowell stated that *P. faberi* was the worst disease of cacao also in Trinidad, but that much could be done to make conditions unfavourable to this fungus by the removal of shade trees. This process required care so as to avoid any sudden shock to the trees, but if properly carried out gave very beneficial results.

Mr. Gadd stated that algal disease (*Cephaleuros mycoidea*) occurred on exposed trees in Ceylon.

Mr. Nowell said that this disease also occurred in the West Indies and was sometimes serious when the conditions of growth were defective.

Several instances were given by various speakers of the disastrous effects of the sudden removal of shade on the health of the trees, and it was agreed that the operation required to be carried out with care.

Meeting : Friday, 4th July, 2.45 p.m.

Chair : Mr. F. A. Stockdale.

Discussion : " The Influence of Soil Conditions on Plant Diseases."

Mr. Nowell (Trinidad) opened a discussion on " The Influence of Soil Conditions on Plant Diseases." The speaker expressed the view that many of the diseases of plants are due primarily to bad soil conditions and that the fungus is only parasitic when these conditions render the host susceptible. Diseases of this nature could be divided into two groups (*a*) root diseases and (*b*) debility or poverty diseases. Root diseases may be occasioned by over-richness in the soil ; in the central portions of Dominica limes are grown in pockets of exceptionally rich soil, and in these places the lime is particularly susceptible to root disease associated with *Rosellinia*. On the other hand, rich soil may induce resistance in certain instances. The cultivation of the Bourbon cane was rendered impossible throughout most of the West Indies by *Colletotrichum falcatum*, but in certain areas of rich soil in Trinidad this variety is still cultivated. Red ring, a nematode disease of the coconut, was mentioned as a type of disease apparently uninfluenced by soil conditions. With regard to debility diseases, these are largely occasioned by poverty of the soil. The root rot of sugar-cane has been attributed to various organisms such as *Marasmius*, *Rhizoctonia*, *Odontia* and *Pythium*, but the speaker thought it was really due to failure to provide the cane with conditions suitable for its growth, the habitual presence of fungi being a consequence of a primary weakness in the plant. Poverty of soil is one of the causes of this weakness, and by good manuring the disease can often be completely overcome. Other unsuitable soil conditions can induce the disease ; thus, by applying ammonium sulphate in excessive quantity so that the soil becomes acid, an outbreak of *Marasmius sacchari* is usually induced. Potash deficiency in cotton leads to a disease known as yellow leaf blight, the leaves showing a peculiar yellowing and later becoming attacked by the weakly parasitic fungi, *Alternaria*, *Macrosporium* and *Cercospora*. Chlorosis of sugar-cane occurs in patches of soil containing excessive amounts of saltpetre. " Blight " of sugar-cane is really due to a soil factor, although insect attack is the immediately exciting cause.

Mr. Tunstall said that most of the diseases of tea can be benefited and many can be controlled by soil treatment and cultivation. Brown blight (*Glomerella cingulata*), grey blight (*Pestalozzia theae*) and red rust (*Cephaleuros mycoidea*) are associated with poverty of soil, generally a deficiency of potash. Manuring with sulphate of ammonia is often followed by disease, especially brown blight. The disease caused by *Botryodiplodia theobromae* can often be cured by applications of nitrate of potash, and examination of the plants after this treatment shows that the fungous hyphæ are absorbed by the host. *Sphaerostilbe repens* and *Poria* sp. occur apparently when the soil is acid, but while it has been found that the appli-

cation of lime prevents the further development of the former disease, it tends to make the latter worse.

Dr. RAYNER asked whether any observations had been carried out on the mycorrhiza of tropical crop plants and pointed out that conditions which induced starvation in the plant might inhibit the development of mycorrhiza and consequently still further reduce the vigour of the plant.

Dr. BUTLER said that he had examined a large number of crop plants in India for mycorrhiza and found the common endophyte with vesicles and arbuscules to be almost universally present, sometimes rare, as in cotton, sometimes in great quantity, as in castor oil and bamboo. Every bamboo he had examined was copiously provided with the endophyte.

Miss WELSFORD (Zanzibar) stated that, so far as she was able to ascertain, clove trees suffering from disease or debility did not have mycorrhiza.

Mr. DOWSON gave various examples of the association of poor soil conditions with plant diseases in Kenya.

Dr. SHAW (India) described the permanent manurial plots at Pusa, and stated that the incidence of wilt of pigeon pea (*Fusarium udum*) was decidedly greater on the superphosphate plots than on the others. Green manuring appeared to counteract this influence of superphosphate to some extent.

Dr. HORNE stated that Bramley's seedling apples from silt soil were much more resistant to fungous attack than apples from the Fenland district. There was also a difference in the acidity of the saps of apples from different localities. Any P_H data which may be available with regard to the cell sap of trees under conditions inducing susceptibility or resistance to disease were much required.

Mr. TUNSTALL said that it was hoped to gain some information with regard to the effect of manures on the constitution of the cell sap of the tea bush, and thought that this would be of use in the direction mentioned by Dr. Horne. He also mentioned the work done in India on the influence of soil conditions, and the application of fertilizers, on the mosquito blight of tea, which appeared to be very markedly affected by certain applications.

Dr. BUTLER suggested some possible explanations of the results observed in the Pusa manurial plots in regard to pigeon pea wilt, and stated that one of the difficulties with regard to obtaining data on the effect of manures on the composition of the host plant was the extraction of samples of the sap that would fairly represent what was present in the living plant.

Mr. TUNSTALL said that a method of extracting the sap had been worked out by Dr. Schryver which might be applicable.

MEETING: SATURDAY, 5TH JULY, 10.30 a.m.

Chair: Mr. W. NOWELL.

Discussion: "The Application of the Results of Mycological Investigation."

Dr. SHAW (India) opened a discussion on "The application of the results of mycological investigation" from the point of view of a tropical country with native cultivators. In India, land is held under two systems: (*a*) in which the "zemindar" owns large areas which he lets out to the peasants, and (*b*) in which the peasant or ryot himself owns the land which he works. The organization of the Indian Agricultural Service was outlined in considerable detail. The headquarters of the service are at Pusa. Two mycologists are stationed there, and under them are a number of Indian assistants and fieldmen. The fieldmen are intended for work requiring close contact with the cultivators. Certain of the larger provinces have a mycological organization of their own, similar in plan to that at Pusa, but where such organizations do not exist the work is undertaken by the Pusa staff. In case of serious outbreaks of disease the central staff assists the provincial one in coping with them. In illustration of the working of the service, the methods which were adopted in dealing with specific diseases were described. In the campaign against palm bud rot (*Phytophthora palmivora*) revenue officers were utilized with great success, and in the scare occasioned by the outbreak of *Diplodia corchori* on jute the police were called upon to help. With regard to the steeping of sorghum seed against smut with copper sulphate,

which is now sold all over Western India in penny packets, the mycological fieldmen give demonstrations of methods to the cultivators, and the matter of selection of sugar-cane setts against red rot (*Colletotrichum falcatum*) is similarly dealt with. More complicated measures, such as those for the *Phytophthora* rot of the areca palm, are directly carried out by the mycological staff. One of the great obstacles to progress is the intense ignorance and conservatism of the cultivator, and this could only be overcome by education and demonstration patiently carried out year after year.

Dr. Murphy (Irish Free State) then dealt with the subject from the point of view of temperate countries with a white population. He was of opinion that phytopathology should develop on the lines of medical science—there should be the local plant doctor as well as the local medical doctor, besides the specialists and investigators. The prime duty of the ordinary pathologist, the "general practitioner," is to deal with the diseases of the country in which he lives, to find remedies for them, and to get these remedies applied. The best work of the phytopathologist is the introduction of control methods. The speaker described his experience in Canada, where the farmers were at first entirely ignorant regarding the *Phytophthora* blight of potatoes, but after demonstrations of the method of control by spraying they eagerly adopted this practice. Phytopathologists should give great care and attention to the introduction of new control methods. These must be simple and should be handed over to the agricultural advisers to be applied when their efficacy was established. The methods now being adopted for the control of the so-called degeneration diseases of potatoes in Ireland were described. The education of the advisers and phytopathologists in the ordinary routine of agriculture and horticulture is most important, and the education of the public in the rudiments of plant diseases is also a matter worthy of close attention.

Mr. Bunting (Gold Coast) said their difficulties in West Africa were that the natives will not carry out the measures recommended to them, and the question arises as to whether any form of compulsion can be utilized to achieve the desired end.

Miss Welsford (Zanzibar) stated that she found the same difficulty in Zanzibar, and inquired whether it was the duty of the Government merely to give advice or to enforce those control measures which are known to be necessary.

Dr. Butler spoke of the outbreak of coconut bud rot in the Seychelles, and in such a case he considered that a campaign should be organized by the Government to get the disease under reasonable control in the first instance. When the disease had been reduced to manageable proportions by these means, then owners of diseased trees should take over the work of control and finally it might be made an offence for anyone to own a diseased tree. It was largely a matter of education of the growers until they came to see that the measures required were reasonable and that it was their duty to carry them out.

Dr. Murphy emphasized the importance of teaching children in elementary schools something about plant diseases.

Dr. Doidge (South Africa) said that organized industries, such as the citrus-growing industry in South Africa, supported the Department of Agriculture in measures for the control of diseases, but that unorganized industries, like tobacco growing, were very difficult to deal with.

Mr. Stockdale (Ceylon) stated that the plantation industries in Ceylon gave little trouble and steps were now being taken to organize research by these industries themselves. The mycologists, entomologists, and other agricultural officers kept in touch with the planters by means of bi-monthly meetings at which a free exchange of opinions took place.

Mr. Nowell then vacated the chair in favour of Sir David Prain.

The report of the Committee appointed on Wednesday, 2nd July, to consider proposals for the future work of the Imperial Bureau of Mycology and their cost was read and discusssed. The report, together with various resolutions and votes of thanks, was then passed unanimously, and the chairman declared the Conference closed.

Appendix IIa.

Minutes of the Committee of the Imperial Mycological Conference appointed to consider proposals for the Future Work of the Imperial Bureau of Mycology and their Cost.

Present.

Dr. Rendle, Managing Committee of the Bureau, *Chairman.*
Dr. Doidge, Union of South Africa.
Professor Ashby, Imperial College of Tropical Agriculture, Trinidad.
Mr. Nowell, Trinidad.
Dr. Shaw, India.
Mr. Bunting, Gold Coast.
Mr. Cunningham, New Zealand.
Dr. Pethybridge, Managing Committee of the Bureau.
Dr. Butler, Director of the Bureau.
Mr. Clutterbuck, Colonial Office, Secretary to the Managing Committee.

1. The Committee considered the following proposals which had been referred to it by the Conference in connection with Item (1) of the Agenda:—

(*a*) It had been suggested that lists of determinations of fungi sent to the Bureau for identification should be published from time to time in the *Review of Applied Mycology*, together with the name of the sender and the locality.

The sense of the Conference had been somewhat adverse to this proposal on the ground that it was desirable for the *Review* to be maintained purely as an abstracting journal. The Committee concurred in this view, but agreed that, in order that the plant disease surveys recommended by the Conference might be the more successfully carried out, measures should be taken to encourage overseas mycologists to send specimens to the Bureau by according the senders some recognition in the *Review*. They, therefore, recommended that a loose leaflet giving the information suggested should be inserted in future copies of the *Review*.

(*b*) A suggestion had been received for the compilation of a list of the names and addresses of plant pathologists in the British Empire, to be published once in two years.

The Committee pronounced themselves strongly in favour of this proposal, and recommended that the preparation of such a list should be undertaken as soon as possible.

(*c*) It had been suggested for consideration that "it would be desirable for the Director or another equally responsible official of the Bureau to visit systematically the mycologists of the Empire."

Financial and other considerations were against this proposal and the general sense of the Committee was that it was impracticable at the present time.

(*d*) A suggestion had been made for the preparation by the Bureau of a series of standard library index cards dealing with the diseases of individual host plants to be sold to those asking for them.

Dr. Butler explained that the Bureau possessed index cards covering the diseases of a limited number of host plants. He saw no objection to having copies of these cards made for sale to individual applicants as required, but he explained that (i) owing to the thickness of the cards it would be impossible to take more than one copy at a time, and that (ii) it would be necessary to hire the services of a special typist in every case, the time of the typists at the Bureau being fully occupied. Each applicant would, therefore, be required to pay the whole cost of copying. There might be difficulty in finding accommodation for the special typist, but some satisfactory solution could probably be found.

The Committee expressed the view that many overseas mycologists might be glad of the opportunity to avail themselves of these facilities and

they recommended that, subject to the stipulations proposed by Dr. Butler, and on the understanding that the proposal would be confined to the index cards already in the possession of the Bureau, an announcement in the sense suggested should be made to contributing Governments.

(*e*) It had been suggested that the Bureau should undertake the preparation and publication of illustrations to assist Departments which are without the services of a mycological officer.

It is clear that the preparation of such illustrations would be an expensive matter and would involve the Bureau in financial loss. Moreover, the Committee considered that the diagnosing of plant diseases from illustrations would be a highly dangerous expedient, and in the circumstances they expressed the opinion that the adoption of the proposal was undesirable.

(*f*) It had been proposed that, in view of the benefits derived from an exchange of views between overseas mycologists, Conferences of a similar character should be held at intervals of five years.

The Committee expressed themselves as strongly in favour of this proposal, and a resolution to this effect was carried unanimously.

2. The Committee proceeded to consider the following suggestions which had been referred to it under Item (2) of the Agenda :—

(*a*) It had been proposed that the Bureau should undertake the publication of a periodical containing original papers. The sense of the Conference had been against this suggestion in view of the ample facilities already in existence for the publication of such papers, and the Committee decided that the proposal should be referred to the next Mycological Conference.

(*b*) It had been proposed that abstracts of the Annual Reports of the Government Plant Pathologists of the Dominions and Colonies should be grouped together in a special Empire number, prefaced in the case of the larger Dominions and Colonies by a short review of the research work done in that Dominion or Colony during the year.

The sense of the Committee was against the adoption of this proposal.

(*c*) It had been suggested that the Bureau should undertake the work of condensing the voluminous literature published on such subjects as "Tobacco Mosaic."

After some discussion the Committee recorded its opinion that, in view of the magnitude of the work involved, the adoption of the proposal was not feasible.

(*d*) A suggestion has been made that the question of undertaking the publication of a "Review of Systematic Mycology" should be considered.

The Committee considered that the publication of such a review was not part of the functions of the Bureau, but they agreed that such a publication would be of considerable value to mycologists and recommended that the suggestion should be brought to the notice of the British Mycological Society.

3. The Committee then turned its attention to the financial requirements of the Bureau. A statement showing the annual receipts and expenditure of the Bureau at the present time was circulated to the Committee, together with an estimate of the annual expenditure of the Bureau during the next five years. This estimate had been approved by the Managing Committee of the Bureau, after examination by the Finance Sub-Committee, and provided for—

(i) The creation of a post of systematic mycologist. This side of the Bureau's work was falling badly into arrear owing to shortage of staff.

(ii) The promotion of the senior Assistant to be Assistant Director, in order that Dr. Butler might be relieved of some of his responsibilities and thus be free to devote his time to more important work.

(iii) The continuation of the incremental scales already in operation.

(iv) The provision of an annual sum of £200 for overseas travel expenses, such sum, if unused in any one year, to be added to the provision made under this head for the ensuing year. The Managing Committee had

expressed its emphatic opinion that the opportunities afforded by invitations to overseas conferences for the Director and his staff to keep in close and constant touch with overseas mycologists should not be neglected, and they considered the provision of funds for this purpose essential.

(v) The provision of a sum of approximately £225 for the establishment of a Provident Fund. This question was at present before the Managing Committee, who had agreed that, in view of the fact that Provident Funds had been established in all similar institutions in the United Kingdom, the creation of such a fund was desirable and had directed that details of the Funds established elsewhere should be obtained in order that the inauguration of a similar Fund for the Bureau might be considered.

After a close examination of the scheme submitted, during which the salaries proposed were examined in the light of those paid to the staff of the Imperial Bureau of Entomology, the Committee expressed the view that although the adoption of the scheme would require an increase of £1,500 per annum in the income of the Bureau, the scheme could not be curtailed without impairing the Bureau's efficiency, and the following resolution was carried unanimously :—

" That this Committee considers the scheme of expenditure placed before it to be essential to the efficient maintenance of the Bureau for the next five years, that an income of £6,500 per annum will be required to enable the scheme to be adopted, and that appeal should be made to the Governments of the self-governing Dominions, India, the Sudan, and the Colonies and Protectorates to provide this sum."

4 July, 1924.

APPENDIX IIb.

ESTIMATED INCOME OF THE BUREAU FOR THE FINANCIAL YEAR 1924-5.

Government grants...	£4,900
Interest	175
Total	£5,075

APPENDIX IIc.

Expenditure of the Bureau on Present Scale.

	Rate of Salary.	Salary on 1st April, 1924.			
Salaries—	£	£			
Director	800–25–1,000	875			
Assistant (Publication) ...	530–20–570	550			
Assistant (Systematic) ...	530–20–570	570			
Abstractor	300–10–320	330*			
,, ...	300–10–320	320			
,, ...	300–10–320	320			
Clerk (General)	156–5–161	161			
,, (Journal)	156–5–161	166			
Laboratory Attendant ...	175	175			
Charwoman (part-time) ...	39	39			
Indexer for *Review* (part-time)	£3 for each month's index.	36			
		——	£3,542	0	0
Apparatus and furniture			50	0	0
Library			80	0	0
General office expenses			150	0	0
Review (deficit)			575	0	0
Pension contribution to India Office			228	11	0
Miscellaneous			50	0	0
Cost of copying card index of parasitic fungi...			200	14	0
Expenses of tours to Australia and West Indies			226	0	0
Total expenditure			£5,102	5	0

* Additional increment for fourth year of service sanctioned at the 9th General Meeting of the Managing Committee, December, 1923.

Estimated Expenditure on Proposed Scale.

	Rate of Salary.	Average Salary.	
Salaries—	£	£	
Director	1,000	1,000	
Assistant Director	700–20–780	740	
Mycologist	600–20–680	640	
Assistant Mycologist	590–20–670	630	
Abstractor	340–10–380	360	
,, ...	330–10–370	350	
,, ...	330–10–370	350	
Clerk (General)	166–5–186	176	
,, (Journal)...	171–5–191	181	
Laboratory attendant	175	175	
Charwoman (part-time)	39	39	
Indexer (part-time)	£4 per month	48	
		———	£4,689
Apparatus and furniture			50
Library			80
General office expenses			150
Review (deficit)			600
Pension contribution to India Office			228
Miscellaneous			50
Overseas travel expenses			200
? Provident Fund at 5 per cent. of salaries			225
Contingencies			228
Total			£6,500

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